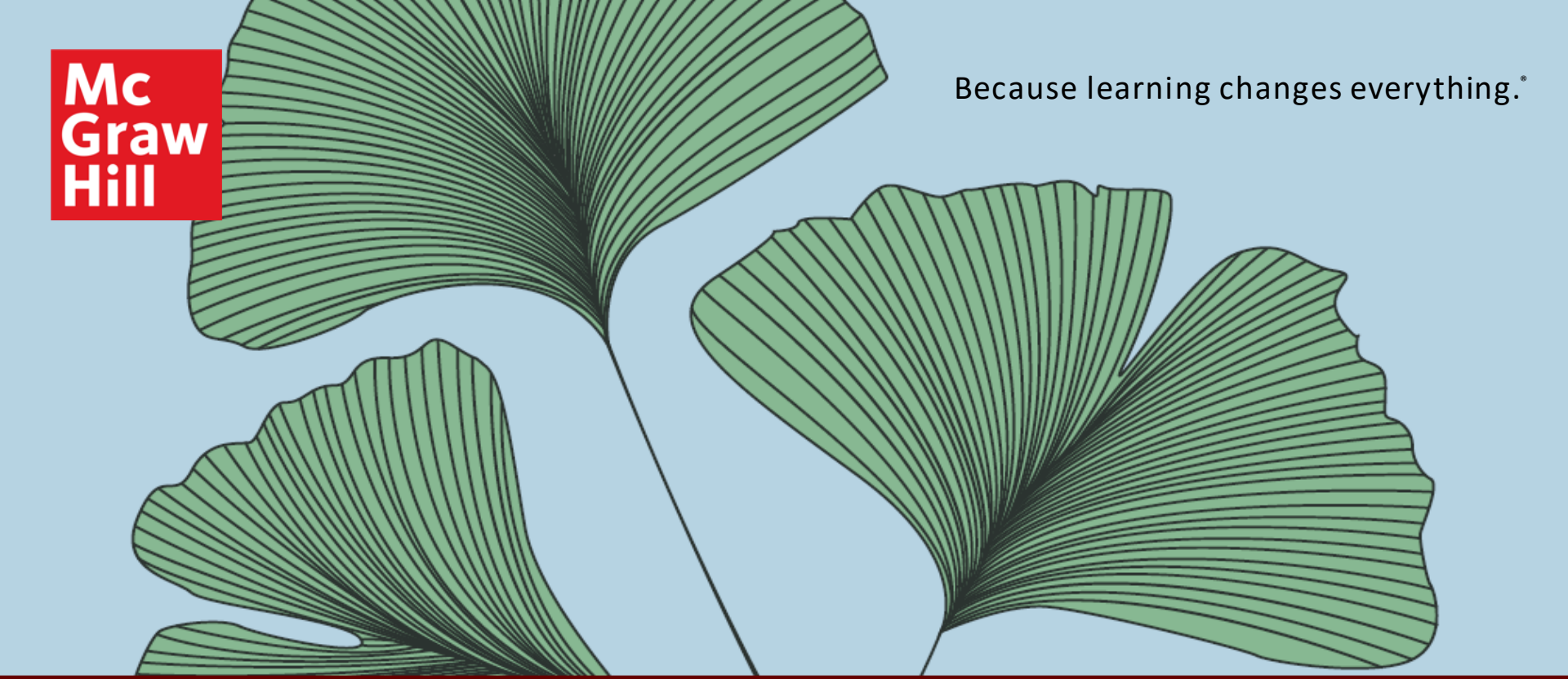

Chapter 4

Measuring Economic Activity: GDP, Unemployment, and Inflation

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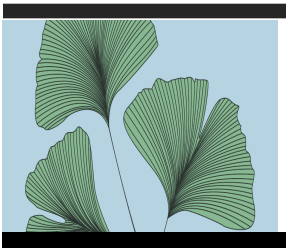

Learning Objectives 1

1. Explain how economists define an economy's output.
2. Apply the production, expenditure, and income methods for measuring GDP to analyze economic activity.
3. Define and compute nominal GDP and real GDP.
4. Define and calculate the unemployment rate and the participation.

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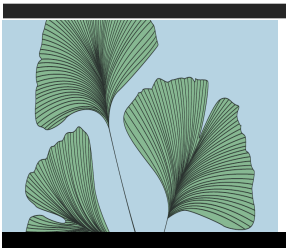

Learning Objectives 2

5. Explain how the consumer price index (CPI) is constructed and use it to calculate the inflation rate.
6. Show how the CPI is used to adjust dollar amounts to eliminate the effects of inflation.
7. Discuss the quality adjustment bias in measuring inflation.
8. Distinguish between inflation and relative price changes in order to find the true costs of inflation.

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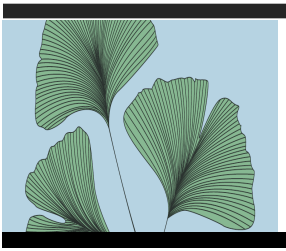

Macroeconomics

Data on output, employment, prices.

- Vital signs of the economy.
  - Employment, unemployment, average work hours.
  - Stock values and trends.
  - Prices and inflation.
- Reported often in the news.

Systematic measurement of economic output developed during World War II.

- Common systems and measures used virtually worldwide.

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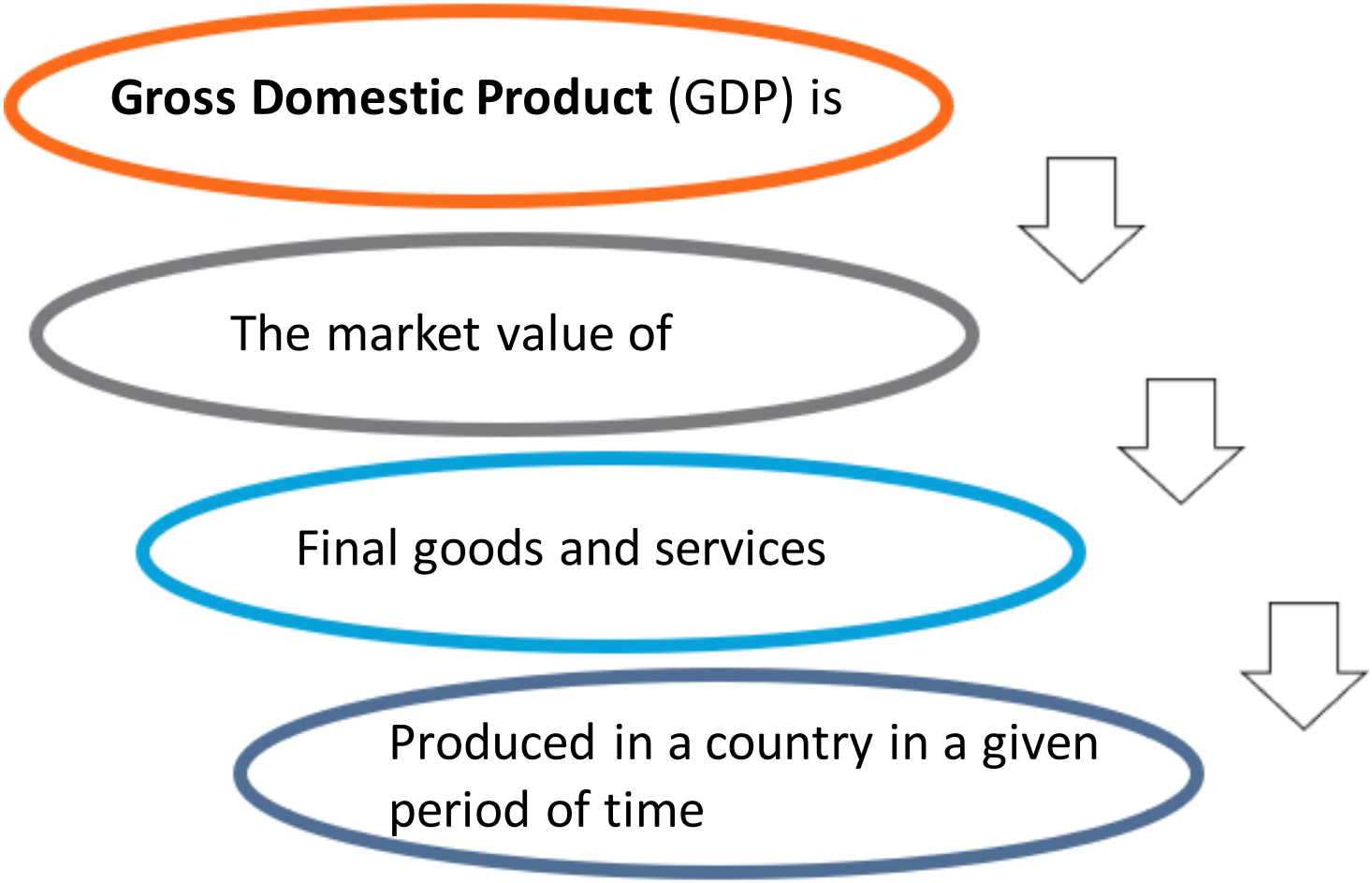
Measuring Output


Gross Domestic Product (GDP) is
The market value of
Final goods and services
Produced in a country in a given period of time

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Market Value

Aggregate measure of quantities produced.

More expensive items receive a higher weighting.

- Willingness to pay is an indication of benefit received from the good.

Orchardia	Apples	Bananas	Shoes
Price	$0.25	$0.50	$20.00
Quantity	4	6	3
GDP contribution	$1.00	$3.00	$60.00

Orchardia's GDP is $64.

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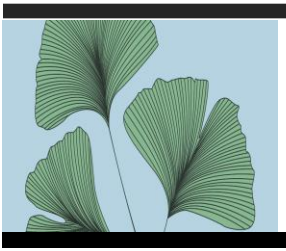

Some Non-Market Goods Included

Government goods and services are not sold in the market.

- These goods have value.
- Increase overall output.
- Quantities are known.
- Prices cannot be established.

Government production is valued at cost.

- Overstates GDP if there is waste and inefficiency.

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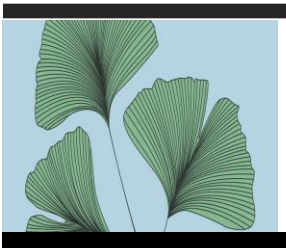

Final Goods and Services

Final goods and services are consumed by the ultimate user.

- End products of production .
- **Included in GDP.**

Intermediate goods and services are used up in the production of final goods.

- **Not included in GDP** to avoid double counting.

A barber's assistant earns $2 per haircut for providing services such as shampooing and sweeping up.

- Barber charges $10 per haircut.
- Haircut's contribution to GDP is $10.

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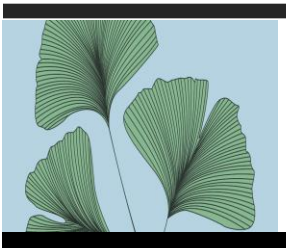

Goods Can Be Final and Intermediate

Milk can be sold as a final product or used as an intermediate good.

- Gallons of milk in the store.
- Gallons of milk sold to restaurants.
- Count only the final goods.

A **capital good** is a long-lived good used in the production of other goods and services.

- Houses, apartments, and motels.
- Stoves in restaurants, cooking schools.
- Delivery vehicles and taxis.

Money is not a capital good.

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Value Added

Value added is the market value of the product minus the cost of inputs purchased from other firms.

- Count value added in the year it is produced.
- Hot'n'Fresh buys flour and other inputs to make bread that sells for $2.00.

Company	Revenues	Cost of Purchased Inputs	Value Added
ABC Grain	$0.50	$0.00	$0.50
General Flour	$1.20	$0.50	$0.70
Hot'n'Fresh	$2.00	$1.20	$0.80
Total			$2.00

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Produced in a Country in a Period of Time

"Domestic" in GDP means the activity is measured within a country's borders.

- Nationality of owners or company is not relevant.

Value must be produced in the year considered.

- Sell a 20-year-old house for $200,000.
  - Pay $12,000 commission.
  - Value added is $12,000.
  - House was not produced in the period of time studied.
  - Count income generated from the sale of used goods.

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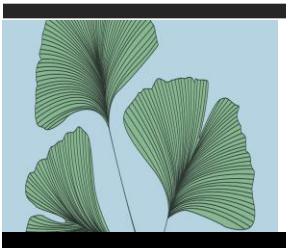

Expenditure Method for Measuring GDP

Four users of final goods.

- Households.
- Government.
- Firms.
- Foreigners.

All goods produced are purchased by one of these groups in a given year.

Amount spent = market value.

GDP can be measured two ways.

- Market value.
- Total spending for final goods less value of imports.

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US GDP, 2019 (billions of dollars)

Consumption		**$14,562.7**
Durable Goods	$1,526.8	
Non-durable Goods	2,978.1	
Services	10,057.7	
Investment		**3,743.9**
Business Fixed Investment	2,878.1	
Residential	797.5	
Inventory	68.3	
Government Purchases		**3,753.0**
Net Exports		**− 631.9**
Exports	2,504.3	
Imports	3,136.1	
GDP		**$21,427.7**

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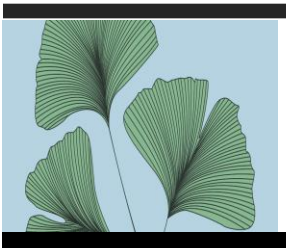

Consumption Expenditure

Consumption expenditure is spending by households for goods and services.

- **Consumer durables** are long-lived consumer goods.
  - Cars.
  - Furniture.
  - Appliances.
- **Consumer non-durable goods** are shorter-lived goods.
  - Clothing.
  - Food.
  - Bedding.
- **Services** are the largest component of consumer spending.
  - Education.
  - Taxi rides.
  - Haircuts.

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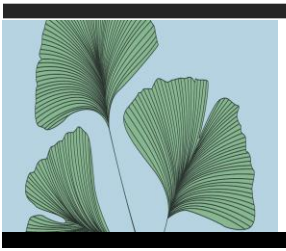

Investment

Investment is spending by firms on final goods and services.

Business fixed investment is purchases of new capital goods.

- Plant.
- Property.
- Equipment.

Residential investment is construction of new homes and apartment buildings.

Inventory investment is the change in unsold goods to the company's inventory.

- These goods are produced but not yet sold.
- This entry can be positive or negative.

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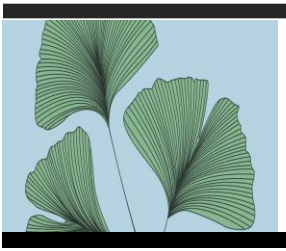

Economic Investment and Financial Investment

Financial investment.

- Purchases of stocks, bonds, and other financial assets.
- Purchase generally transfers ownership of a portion of the firm's **existing** capital stock.
- Does not correspond to any increase in physical capital or production capacity, in most cases.
  - New stock issues can be an exception.

Economic investment: the increase in the capital goods used to produce other goods.

- This value is based on the purchase price of the capital goods, not on stock value.

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Government Purchases

Government purchases are final goods and services bought by federal, state, and local governments.

- Fighter jets.
- Teaching.
- Office Supplies.

Excludes **transfer payments.**

- Transfer payments are made by government, but the government receives no current goods or services.
  - Social Security.
  - Food Stamps.
  - No purchases of final goods and services involved in transfer payments.
    - Spending by recipients is included in GDP.

Excludes interest paid on government debt.

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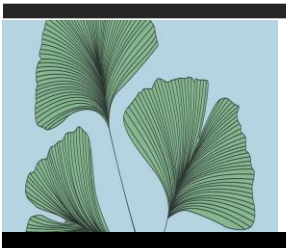

Net Exports

Net exports equal exports minus imports.

- Exports are goods and services produced domestically and sold abroad.
  - Exports reduce the amount available to the domestic economy.
- Imports are purchases in the U.S. of goods and services produced abroad.
  - Imports can be consumption, investment, or government spending.
  - Imports increase the amount available to the domestic economy.

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GDP Expenditures Equation

Terminology

Y	Gross Domestic Product or output
C	Consumption Expenditure
I	Investment
G	Government Purchases
NX	Net Exports

- Expenditure approach to measuring GDP.

$$Y = C + I + G + NX$$

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GDP Example

Total production is 1 million cars, $15,000 each.

Production value is 1 million times $15,000 = $15 billion.

Sector	# Cars Purchased	GDP Contribution
Consumers	700,000	$10.500 billion
Businesses	**225,000**	**$3.375 billion**
Government	50,000	$0.750 billion
Net exports	25,000	$0.375 billion
Total	**1,000,000**	**$15.000 billion**

- 25,000 cars are unsold.
  - Investment in inventories increases by $0.375 billion.

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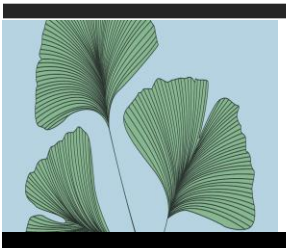

Income Approach to GDP

When a good is sold, its proceeds are distributed to workers or business owners.

GDP = labor income + capital income.

Labor income is wages, salaries, benefits, and incomes of the self-employed.

- About 75% of GDP.

Capital income pays for physical capital and intangibles.

- Profits for business owners.
- Interest for bond holders.
- Measured before taxes.
- Rent for land.
- Royalties.

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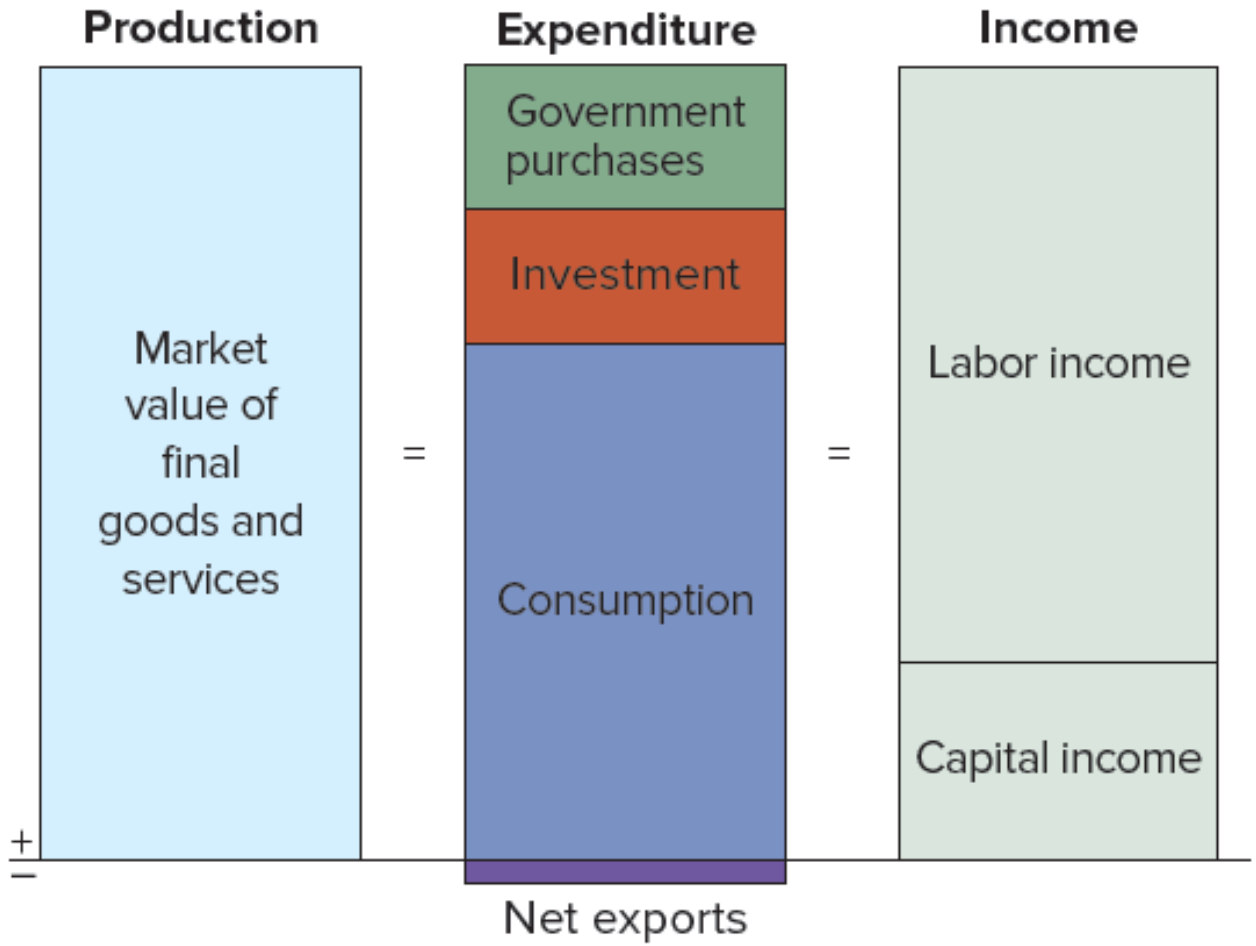
The Three Faces of GDP



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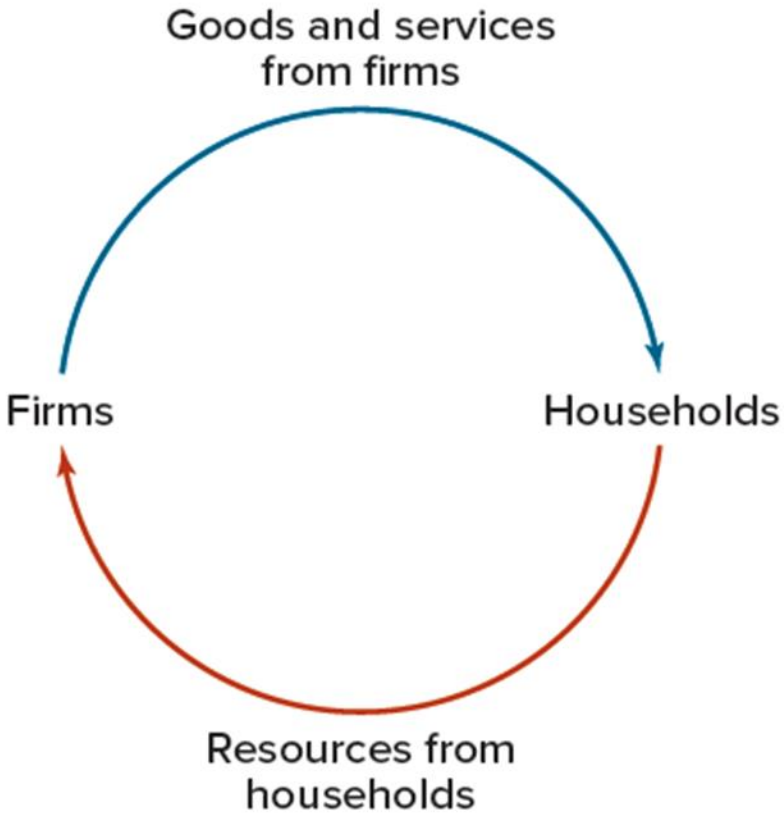
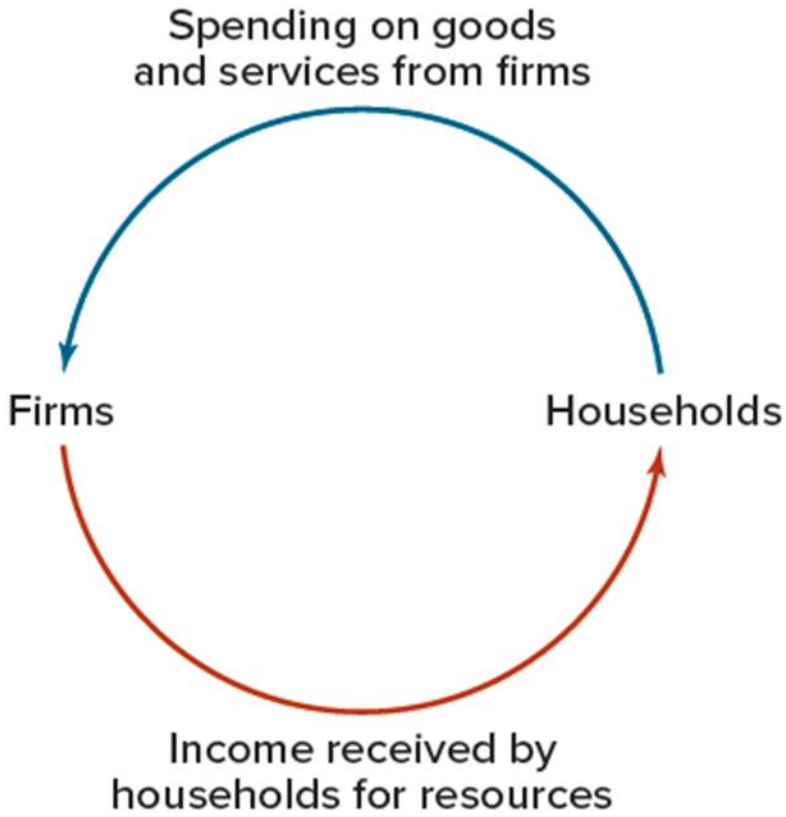
Circular Flow Diagrams





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Adjusting for Price Changes

Compare GDP for different years to see how much output has changed.

GDP changes over time because.

- Prices change AND.
- Quantity of output changes.

To see how much output has grown, use only the changes in quantities.

- Hold prices constant.

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The Pizza and Calzone Economy

GDP in 2016 is $175; GDP in 2020 is $420.

- GDP in 2020 is 2.4 times the GDP in 2016.

Only twice as many pizzas and calzones were produced in 2020.

- Market value of output grew faster than the physical volume of output.

	Number of Pizzas	Price of Pizza	Number of Calzones	Price of Calzones
2016	10	$10	15	$5
2020	20	$12	30	$6

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Real GDP and Nominal GDP

Real GDP values output in the current year using the prices from the base year.

- The base year is a reference year that changes infrequently.
- Real GDP measures the physical volume of production.

Nominal GDP values output in the current year using prices from the current year.

- Nominal GDP is the current dollar value of production.

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Calculating Real GDP for 2020

Use 2016 as the base year.

Nominal GDP for 2016 is $175 and for 2020, $420.

Calculate real GDP using current year quantities and base year prices.

- Real GDP in 2020 is

  (20 pizzas) ($10) + (30 calzones) (5) = $350.

  - Real GDP doubled between 2016 and 2020.

	Number of Pizzas	Price of Pizza	Number of Calzones	Price of Calzones
2016	10	$10	15	$5
2020	20	$12	30	$6

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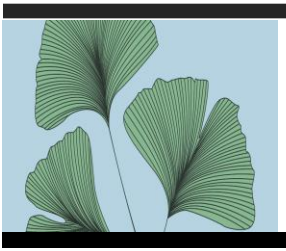

Observations on Real and Nominal GDP

Usually, nominal and real GDP increase each year.

Nominal GDP can go up and real GDP go down.

- Fewer goods and services produced AND.
- Prices increase faster than output decreased.

Nominal GDP will be smaller than real GDP if the prices in the current year are less than in the base year.

- Usually true for years before the base year.

Real GDP could rise and nominal GDP fall, but this is rare

- Prices are falling faster than output is increasing.

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Measuring Unemployment 1

Bureau of Labor Statistics (BLS) estimates employment and unemployment monthly.

Monthly survey of 60,000 randomly selected households, each person 16 years or older is placed in one of the following categories.

- **Employed**: worked full-time or part-time during the past week or is on vacation or sick leave from a regular job.
- **Unemployed**: did not work during the preceding week but made some effort to find work.
- **Out of the labor force**: did not work in the past week and did not look for work in the past four weeks.

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Measuring Unemployment 2

- **Labor force** = employed + unemployed.
- **Unemployment rate** = unemployed / labor force.
- **Participation rate** = labor force / population 16^{+}.

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U.S. Employment Data

U.S. Employment Data, November 2019 (in millions)	
Employed	158.59 million
Unemployed	5.81 million
Labor Force	164.40 million
Not in the Labor Force	95.62 million
Working-Age Population	260.02 million
Unemployment Rate	3.5%
Participation rate	63.5%

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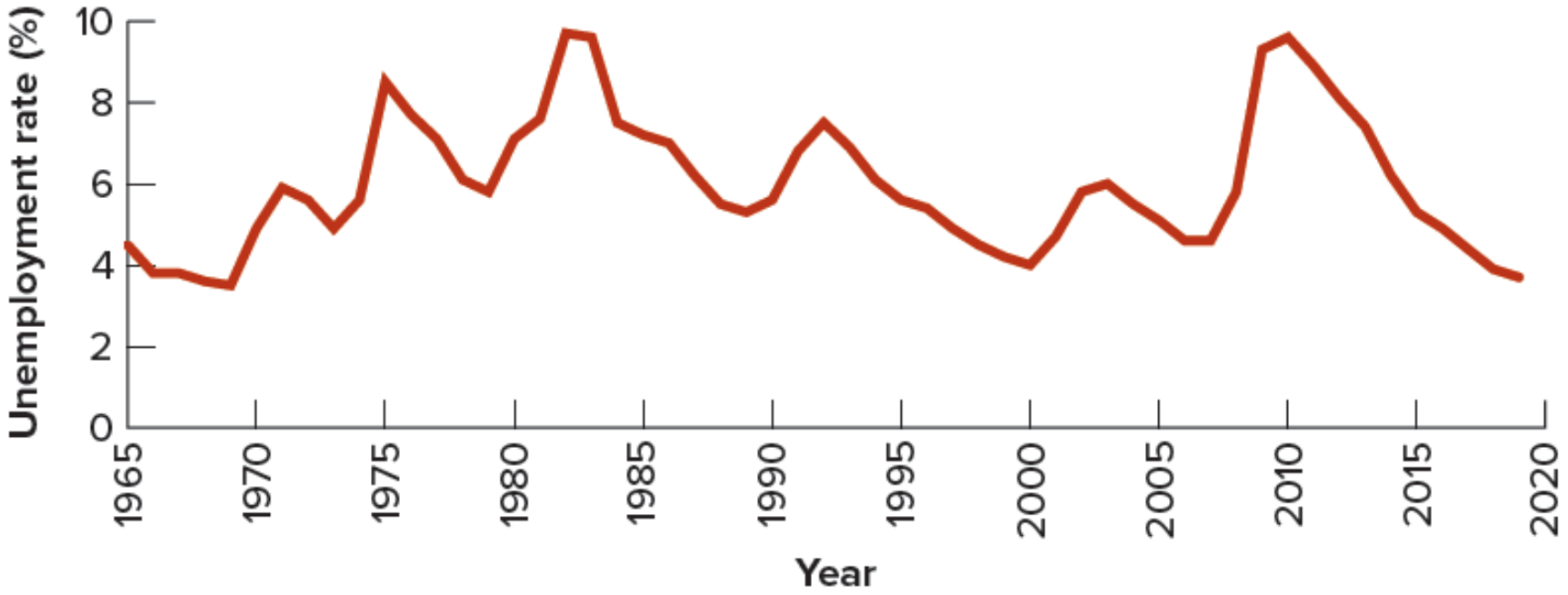
U.S. Unemployment Rate, 1965 - 2019



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Costs of Unemployment

Economic costs.

- Lost wages and production.
- Decreased taxes and increased transfers.

Psychological costs.

- Individual self-esteem.
- Family stress of decreased income and increased uncertainty.

Social costs.

- Potential increases in crimes and social problems.
  - Social resources spent to address these.

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Duration of Unemployment 1

Costs of unemployment are directly related to the length of time a person has been unemployed.

- **Unemployment spell** is the period during which an individual is continuously unemployed.
- **Duration of unemployment** is the length of the unemployment spell.

The unemployed population:

Duration (weeks)	5 or less	5 – 14	More than 14
% of unemployed (Apr 2011)	20%	22%	58%
% of unemployed (Nov 2019)	34%	30%	36%

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Duration of Unemployment 2

Long-term unemployed have been out of work for 6 months or longer.

Short-term unemployed have several possible outcomes.

- Find a permanent job after searching a few weeks.
  - Economic costs are low.
- Leave the labor force.
- Short-term or temporary job that leads to unemployment again.
  - These chronically unemployed have costs similar to the long-term unemployed.

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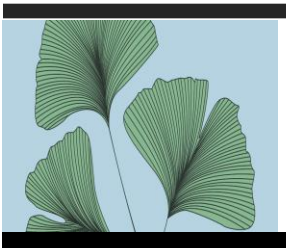

Other Unemployment Issues

Discouraged workers would like to have a job but they have not looked for work in the past four weeks because they believe they are no jobs available.

- Counted as out of the labor force.
- Could be counted as unemployed but they are not.

Involuntary part-time workers are people who like to work full-time but cannot find a full-time job.

- Counted as employed.

November 2019 unemployment rate was 3.5%.

- Including discouraged workers and involuntary part-time workers would make the rate 6.9%.

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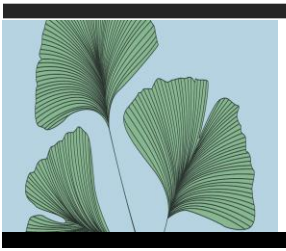

Measuring the Price Level

The **consumer price index (CPI)** is a measure of the cost of living during a particular period.

The CPI measures.

- The cost of a standard basket of goods and services in a given year.
- relative to the cost of the same basket of goods and services in the base year.
- Base year changes periodically.

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Calculating the CPI [1]

Item	Monthly Cost in 2015
Rent (2-bedroom apartment)	$750
Hamburgers (60 at $2 each)	120
Movie tickets (10 at $6 each)	70
Monthly expenditures	$940

Item	Monthly Cost in 2020
Rent (2-bedroom apartment)	$945
Hamburgers (60 at $2.50 each)	150
Movie tickets (10 at $7 each)	80
Monthly expenditures	$1,175

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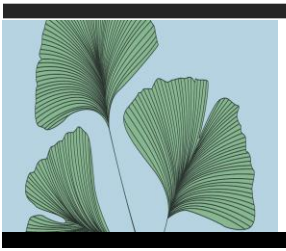

Calculating the CPI 2

CPI is the ratio of the cost of the basket of goods in the current year to the cost in the base year.

- Base year cost $940.
- 2020 cost $1,175.

$$CPI = (1{,}175 / 940)\ (100) = 1.25$$

Cost of living in 2020 is 25% higher than in 2015.

- CPI for the base year is always 1.
- CPI for a given period is the cost of living in that period relative to what it was in the base year.
- BEA uses CPI as a percentage – the ratio times 100.

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Cost of Living

CPI = 1375 / 1060 = 1.30

Item	Monthly Cost in 2015
Rent (2-bedroom apartment)	$750
Hamburgers (60 at $2 each)	120
Movie tickets (10 at $6 each)	70
Sweaters (4 at $30)	120
Monthly expenditures	$1,060

Item	Monthly Cost in 2020
Rent (2-bedroom apartment)	$945
Hamburgers (60 at $2.50 each)	150
Movie tickets (10 at $7 each)	80
Sweaters (4 at $50)	200
Monthly expenditures	$1,375

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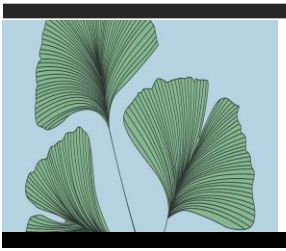

Price Index

A **price index** measures the average price of a given quality of goods and services relative to the price of the same goods and services in a base year.

CPI measures the change in consumer prices.

Other indices.

- Core inflation is CPI without energy and food.
- Producer price index.
- Import / export price index.

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Inflation

The **rate of inflation** is the annual percentage change in the price level .

Inflation in 2016.

(2.40 – 2.37) / 2.37 = 0.0126 = 1.3%.

The Great Depression.

- Period of falling output and prices.
- When inflation rates are negative there is **deflation.**

Year	CPI	Inflation
2015	2.37	
2016	2.40	1.3%
2017	2.45	2.1%
2018	2.51	2.4%
2019	2.56	2.0%

Year00	CPI	Inflation
1929	0.171	
1930	0.167	−2.3%
1931	0.152	−9.0%
1932	0.137	−9.9%
1933	0.130	−5.1%

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Adjusting for Inflation 1

A **nominal quantity** is measured in terms of its current dollar value.

A **real quantity** is measured in physical terms.

- Quantities of goods and services.

To compare values over time, use real quantities.

- **Deflating** a nominal quantity converts it to a real quantity.
  - Divide a nominal quantity by its price index to express the quantity in real terms.

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Family Income in 2015 and 2020

Can a family buy more with $40,000 in income in 2015 or with $44,000 in 2020?

- 2015 is the base year for the CPI.
- Deflate nominal income in both years to get real income.
- Compare real income.
- $40,000 in 2015 has the greater purchasing power.

Year	Nominal Income	CPI	Real Income
2015	$40,000	1.00	$40,000/1.00 = $40,000
2020	$44,000	1.25	$44,000/1.25 = $35,200

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Baseball Stars

Compare Babe Ruth's salary with Stephen Strasburg‘s.

- Requires a CPI series that includes 1930.
  - CPI using 1982 – 1984 as base year.
- Strasburg had higher real salary.

Does not convey information about relative incomes.

- 1930 was Great Depression .
- Multi-million-dollar salaries common for sports stars in 2019.

Player	Year	Nominal Salary	CPI	Real Salary
Babe Ruth	1930	$80,000	0.167	$479,042
Stephen Strasburg	2019	$38,300,000	2.57	$14,902,724

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Real Wages

The **real wage** is the wage paid to the worker measured in terms of purchasing power.

- The real wage for any given period is calculated by dividing the nominal wage by the CPI for that period.

U.S. production worker wages.

- CPI uses 1982 – 1984 as base year.
- Real wages stayed roughly the same between 1970 and 2019 despite the fact that the nominal wage in 2019 was almost 7 times the nominal wage in 1970.

Year	Average Wage	CPI	Real Average Wage
1970	$3.40	0.388	$3.40 / 0.388 = $8.76
2019	$23.51	2.56	$23.51 / 2.56 = $9.18

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Indexing

Indexing increases a nominal quantity each period by the percentage increase in a specified price index.

- Indexing prevents the purchasing power of the nominal quantity from being eroded by inflation.

Indexing automatically adjusts certain values, such as Social Security payments, by the amount of inflation.

- If prices increase 3% in a given year, the Social Security recipients receive 3% more.
  - No action by Congress required.
- Indexing is sometimes included in labor contracts.

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Adjusting for Inflation 2

An indexed labor contract.

- First year wage is $12 per hour.
  - Real wages rise by 2% per year for next 2 years.
- Relevant price index is 1.00 in first year, 1.05 in the second, and 1.10 in the third.

Nominal wage is real wage times the price index.

Year	Real Wage	Price Index	Nominal Wage
1	$12.00	1.00	$12.00
2	$12.24	1.05	$12.85
3	$12.48	1.10	$13.73

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Minimum Wage

Congress sets the national minimum wage in nominal terms.

- Publicized debate results in periodic increases.
  - Indexing would be simpler and less controversial.
  - Politicians appear to benefit from the debate.

Minimum wage has increased steeply over the years.

- Real minimum wage has decreased by almost 30% since 1970.

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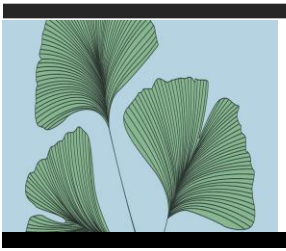

CPI and Inflation

CPI and other indexes influence policy decisions and wage increases.

Inflation may be overstated.

- Unnecessarily increases government spending.
- Underestimates increase in the standard of living.
  - Suppose CPI indicates 3% inflation when cost of living actually increases 2%.
    - Real income increases 1%.

The Bureau of Labor Statistics makes great efforts to improve CPI calculations.

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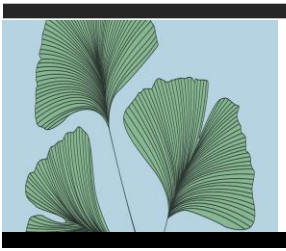

The Costs of Inflation

The **price level** is a measure of the overall level of prices at a particular point in time.

- Measured by a price index such as the CPI.

The **relative price** of a specific good is a comparison of its price to the prices of other goods and services.

- Calculated as a ratio.

Suppose we have a one-time doubling of the gas price.

- Overall price level and inflation increase by a small amount.
- The increase in the relative price of gasoline is large.

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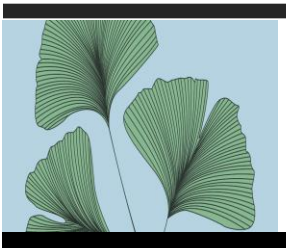

Relative Prices

- Relative prices can change markedly without corresponding changes in inflation.
- Summer prices.

Higher	Lower
• Beach hotels. • Cruises. • Gas prices.	• Fresh fruit and vegetables. • Heating oil.

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Inflation Increases the Cost of Cash

If there is no inflation, cash holds its value over time.

- Some cash will be held for convenience.

When inflation is high, cash loses value over time.

Manage cash balances to limit losses.

- More frequent, smaller withdrawals cost consumers and businesses time, travel – a real cost of inflation.
- Banks process more transactions, increasing costs – another real cost of inflation.
- Costs of managing cash holding are called "**shoe- leather**" costs, referring to the cost of frequent trips to the bank.

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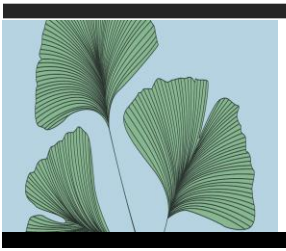

Noisy Prices

Prices transmit information about.

- The cost of production and.
- The value buyers place on buying an additional unit.

Inflation creates static in the communication.

- Buyers and sellers can't easily tell whether.
  - The relative price of this good is increasing OR.
  - Inflation is increasing the price of this good and all others.
- Deciding these issues requires market participants gather information – at a cost.
- Response to changing prices is tentative and slow.

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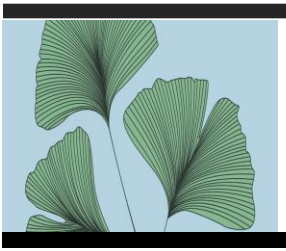

Distortions of the Tax System

Many provisions of the tax code have not been indexed.

- Lack of political support.
- Too complex.

Produces unintended changes in the taxes people pay, which may cause them to change their behavior in economically undesirable ways.

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Arbitrary Redistribution of Wealth

Unexpected inflation **redistributes wealth.**

Suppose workers' salaries are not indexed and inflation is higher than anticipated.

- Salaries lose purchasing power.
- Employers gain at the expense of workers.

Similarly, unexpectedly high inflation benefits borrowers at the expense of lenders.

- Borrowers repay with dollars worth less than anticipated.

Unexpected inflation confuses incentives.

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Interference with Long-Term Planning

Some decisions have a long time horizon.

- Erratic inflation makes planning risky.

Retirement planning requires an estimated cost for your desired life-style.

- Save too little and you live less well in the future.
- Save too much and you live less well now.

Given the costs of inflation, most economists agree that low and stable inflation promotes a healthy economy.

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